



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# CHEMISTRY.

---

No. I.

APPLICATION OF  
PLUMBAGO TO NON-CONDUCTING SUBSTANCES  
FOR THE  
PRODUCTION OF VOLTATYPES.

*The SILVER MEDAL and TEN POUNDS were presented to Mr. ROBERT MURRAY, 122 Regent Street, for his Method of obtaining Voltatype Impressions from Non-conducting Substances by Means of Plumbago; specimens have been placed in the Society's Repository.*

SIR,

122 Regent Street,  
May 26, 1840.

I SHALL feel obliged by your informing the Committee that I shall be happy to lay before them my process of copying, by the electrotype, works of art from wood, plaster, wax, &c. &c., by rendering the surface a conductor by means of *Plumbago*.

I remain, &c. &c.,  
W. A. GRAHAM, Esq. ROBERT MURRAY.

As soon as the first excitement of admiration for the beautiful application of the voltatype process in copying from metallic surfaces had subsided, it became a desideratum to be enabled to copy such non-conducting bodies as paper, wax, wood, plaster, &c. And it is to Mr. Edward Solly, jun. that we owe the first successful essay in copying a receipt stamp from paper, which was done in the most perfect manner. His process was to render the surface of the paper a conductor, by covering the paper with a solution of nitrate of silver, and then submitting it to the action of light: the surface became blackened by the reduction of the silver; and upon this he deposited his copper. This beautiful process, as a first step, was perfectly successful. From a knowledge of Professor Daniell's and Mr. Cooper's experiments with carbon for galvanic purposes—the former, in effecting decompositions with electrodes of plumbago, and the latter, by making a battery with common coke, &c.—it occurred to me that a thin surface of plumbago\* would suffice as a conducting medium for voltatype purposes, for such substances as wax, plaster, &c., to which the nitrate of silver was inapplicable. I accordingly tried it on a plaster cast with success. I next tried sealing-wax, and then a wood-block, with equal success; in short, any non-conducting surface, covered with the *thinnest* possible coating, is sufficient for the purpose.† An objection was made as to the probability of its filling up the fine lines, which I

\* This substance is also known by the names of graphite and black lead, and was supposed to be a carburet of iron; but it has been found by Dr. Karsten of Berlin to consist of nearly all pure carbon, with a small quantity of iron in the state of mechanical mixture.

† Up to this time it was supposed that a metallic surface was indispensable; and many persons still talk of metallising the surface when they use plumbago.

have been enabled to set at rest as fallacious; for I have copied Barton's Iris buttons (which have 2000 lines to the inch) from sealing-wax impressions. I have also succeeded in copying some specimens from sealing-wax impressions furnished me by Mr. Barton, ruled by his beautiful machine, as many as 8000 to the inch. In using plumbago for the voltatype process, it is necessary that it be perfectly dry, and tolerably pure,—that usually sold under the denomination of the "Servant's friend, or true Mexican jet lead," being quite sufficient for every purpose. Care should be taken that every part of the object is covered; and as a few instructions will be necessary for the preparation of the moulds, the covering them with the plumbago, &c., I shall briefly state them.

Nothing appears so easy as to take a common sealing-wax impression: this, however, will be found a little more difficult than is at first imagined, and many precautions are necessary for complete success. A stout paper\* should be selected, and must be well dried before the fire, or over the flame of a candle: the wax is then to be heated over the flame (care being taken that it does not take fire) until it is sufficiently softened to be deposited on the paper; the paper with the wax is then, for a short time, to be held some distance above the flame, until the wax is sufficiently fluid to be worked up with the stick of wax. When the whole of the air-bubbles are got rid of, and a clear surface obtained, the seal is to be warmed to a degree just bearable on the back of the hand, and then pressed firmly into the wax, and, when cold, to be removed with a sudden perpendicular pull. In the event

\* Card should never be used for this purpose, as the paste and air contained between the folds expand, and prevent the possibility of obtaining a perfect impression.

of the impression not being satisfactory, it may again be used by holding the paper over the flame until the wax is sufficiently soft to be worked up with the stick, as before described. A good impression having been obtained, the plumbago is to be applied to the surface, and quickly brushed with a circular motion with a stiff brush, such as is used by jewellers. Some persons, I find, have a difficulty in making the plumbago take to the perpendicular sides of the impression: this part may be touched with the point of a stick dipped in spirit of wine, great care being taken that none of it gets on the surface of the impression, as it will injure the sharpness. The surface having been well covered with plumbago, a copper wire is to be made hot enough to melt the wax, and is to be pressed into some convenient part of the margin of the mould which will not interfere with the impression: and now, to ensure *perfect* contact between the wire and the plumbago on the surface, a small quantity must be rubbed on to both with the finger. This I find the most effectual means of securing perfect continuity between the wire and the blackened surface. (I need hardly say that whatever material is used for the mould, unless great care be taken to ensure a *perfect* contact between those two surfaces, we shall be continually subjected to disappointments.) Having prepared it thus far, it is ready to be put into any of the usual forms of voltatype apparatus. But just before immersing it into the solution, the surface of the mould should be slightly moistened by breathing on it; and this holds good for any sort of voltatype mould, as it prevents the accumulation of air-bubbles, by ensuring a complete contact between the surface and the fluid in which it is immersed. Having obtained a good deposit

of copper, we next proceed to fill in the back with solder, and this is best effected by wetting the back surface of the copper with a camel's hair pencil dipped in a mixture of the solution of the muriate of zinc and muriate of ammonia: common tinman's solder is then to be placed on it, and melted by holding it over the spirit-lamp.

White wax, such as is used for candles, is a very excellent material for larger moulds. The wax having been melted in any convenient vessel over the fire, the object to be copied, if of metal, should be made very warm, and the edge surrounded by a narrow strip of paper passed several times round; the surface of the object must be oiled with a *very small* quantity of salad oil. The wax is now to be poured on, and left for a few hours before it is removed, that is, until it is perfectly cold; should the wax adhere firmly to the medal (which will be the case, more or less, according to the depth of the subject), the back of the medal should be slightly warmed before the fire, trying from time to time to remove the wax; for, if made too hot, the surface of the impression will be spoiled. The same process as recommended for preparing the sealing-wax with plumbago, &c. is to be pursued, using now, instead of the jeweller's brush, a stiff camel's hair pencil of tolerable size. Stearine may also be used (for copying from metal) with advantage, with this additional recommendation, that it is not so liable to adhere as the white wax. If a reverse from a plaster cast is required in white wax, it is only necessary to very slightly oil its surface, and afterwards dip the back of the plaster in water, so that it may imbibe enough to force the oil to the surface: the oil will be thus prevented from soaking into the body of the plaster. Paper is now

to be fastened round the edge, the melted wax is to be poured on as before described, and, as soon as it is cold, it will immediately separate.

Fruit, leaves, &c., are very readily covered with copper by merely brushing them over with the plumbago, and attaching the stalk to a piece of copper-wire, so as to make a good contact between it and the surface.

To copy wood-blocks, it is only necessary to well varnish the back and edges of the block with shell lac dissolved in spirit of wine, so as to prevent any of the sulphate of copper entering the pores; and, having covered the face with plumbago by well brushing it with a hard brush, fasten a riband of copper round the edge, proceed, as before directed, to ensure perfect contact, &c., which may be very much assisted by fastening the copper riband in several places with small copper tacks. Having in this way succeeded in getting a perfect reverse of the wood-block, this is to be used as the matrix, or mould, from which as many facsimiles of the wood-block can be obtained as may be required, the backs being filled in with solder, as recommended for seals; and having been made of equal thickness throughout, they are then fit to be printed from.

Embossed paper, printed paper, and, in short, any thing in relief or a variable surface on paper, may be faithfully copied by melting sealing-wax on the surface, and, when cold, by washing away the paper by means of a brush and water. If of large size, the paper should be fastened on the back with gum-water to a piece of plate-glass, and sealing-wax melted in a ladle poured over the face of the paper, and, when cold, soaked in water, when it will be easily removed from the glass, and the paper may be worked off as before recommended. This process

of first taking it in wax I find far preferable to using the paper itself to precipitate on. The sealing-wax mould is now to be prepared precisely as recommended in the case of the seals, before described.

To copy plaster casts it is necessary to prevent the solution of copper entering the plaster; and this is done by making the mould very hot, and brushing the face with a camel's hair pencil dipped in melted white wax until it is nearly cold; and if any of the wax remain on the surface, it is to be heated before the fire until it disappears: the back and edges, before becoming quite cold, should be covered with the melted wax or tallow. It is now to be left for some hours, until quite cold, and then proceed as in the case of the white wax. In both cases, I should observe, a piece of copper wire must be put round the edge, and twisted, so as to secure it there. This, I find, is the best method to ensure a good contact, which is so essentially necessary, that I cannot help again impressing it on all those who wish to pursue this subject. The wire and the edge of the mould should be well rubbed with the plumbago.

In conclusion, I must offer my best thanks to Mr. Barclay of Gerrard Street, Mr. Doubleday of the British Museum, and Mr. Smee of the Bank of England, for the very able manner in which they have carried out and extended the use of the plumbago.

122 *Regent Street.*

ROBERT MURRAY.

---

*Royal Institution, 11th Feb. 1841.*

I HAVE not the least doubt of the important discovery of the use of plumbago in voltatyping having originated with



Mr. Murray. He was the first who pointed it out to me; and although several other claimants have been mentioned, I do not believe that any one employed the process, and certainly did not make it known, previous to Mr. Murray.

WILLIAM THOMAS BRANDE.

*King's College, 17th Dec. 1842.*

MY DEAR SIR,

IN reply to your request that I will state my opinion of your application of plumbago to non-conducting substances for the production of voltatypes, I beg to state that, to the best of my belief, the invention originated with you; that the method is quite perfect; and that it is likely to prove of the highest service in the arts.

Yours very truly,

*To Mr. Murray.*

J. H. DANIELL.

*Dec. 18th, 1840.*

HAVING had frequent opportunities of witnessing Mr. Robert Murray's process for obtaining copies in precipitated copper, by the aid of plumbago, of seal-impressions, wood-blocks, &c.—things themselves impervious to the voltaic current—I beg to testify my conviction of the great importance of this discovery.

The very numerous specimens which Mr. Murray has produced are beautiful in the extreme. Impressions taken from electrotype copies of wood-blocks obtained by this process are, to me at least, absolutely indistinguishable from those derived from the original; while the process itself is so simple and manageable that, with proper precautions, success is in every case certain. I may observe,

also, that the copperplate so produced is extremely tough and uniform in thickness, and that its formation proceeds very rapidly.

*Chemical Laboratory,  
Charing Cross Hospital.*

GEORGE FOWNES.

---

No. II.

PROCESS FOR ASSAYING THE ORES OF  
MANGANESE.

*The GOLD ISIS MEDAL was presented to Mr. LEWIS THOMPSON, Royal Polytechnic Institution, for the following Communication on his Process for Assaying the Ores of Manganese.*

GENTLEMEN,

ALTHOUGH the Ores of Manganese constitute so important a feature in the mining interests of this country, yet we have not at the present day any method by which these ores can be correctly assayed so as to determine their value for commercial purposes. At first sight it would appear that this object might easily be obtained by heating a given portion of the ore, and collecting the oxygen gas disengaged by the action of the heat, the quantity of gas indicating the quantity of peroxide, and, consequently, the value of the ore; but not only does the peroxide of manganese give off oxygen when heated, but the sesquioxide and red oxide are also decomposed by heat, according to the degree of temperature and other circumstances not well understood, so that the substance remaining in the retort may be protoxide, red oxide, or sesquioxide of manganese, or a mixture of these three